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Foliar epiphytes as bioindicators of *Posidonia oceanica* state of preservation

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INTRODUCTION

Out of the 5 marine phanerogams found in the Mediterranean Sea, *Posidonia oceanica* (L.) Delile, 1813 is the only one which is endemic. It forms extensive seagrass meadows which are very important at:

- Ecological level** → to act as a substrate, refuge or place of settlement for many species.
- Economical level** → to provide a wide variety of ecosystem services.

Unfortunately, they are subjected to a list of threats which put at risk the diversity associated with them.



AIMS OF THE STUDY

- To see if a *Caulerpa spp.* community has less biodiversity associated than a healthy *P. oceanica* community.
- To analyse the foliar epiphytes of *P. oceanica* in a good state of preservation vs. a degraded one.
- To understand the trend of *P. oceanica* meadows taking into account the current situation.

METHODOLOGY

Bibliographical information was searched and classified into 2 groups: those which described a typical or healthy meadow and those which referred to a degraded one.

Healthy *Posidonia oceanica* habitat

Ballesteros et al., 1984	Rossi & Vert, 2002	Ruiz et al., 2015	Ballesteros, 1984	Box, 2008	Curcó et al., 2008
41 spp.	7 spp.	42 spp.	39 spp.	3 spp.	20 spp.

↓
Coinciding in ≥ 2 sources

Ca	Pre	Ge	In
13 spp.	6 spp.	2 spp.	6 spp.

Total species: 27

Degraded *Posidonia oceanica* habitat

Prado et al., 2007	Prado et al., 2008
31 spp.	29 spp.

↓
Coinciding in the 2 sources

Ca	Pre	Ge	In
3 spp.	4 spp.	2 spp.	4 spp.

Total species: 13

Legend:
Ca= Characteristic
Pre= Preferential
Ge= Generalist
In= Indeterminate

Figure 1. Methodology diagram used for the habitat characterisation and comparison.

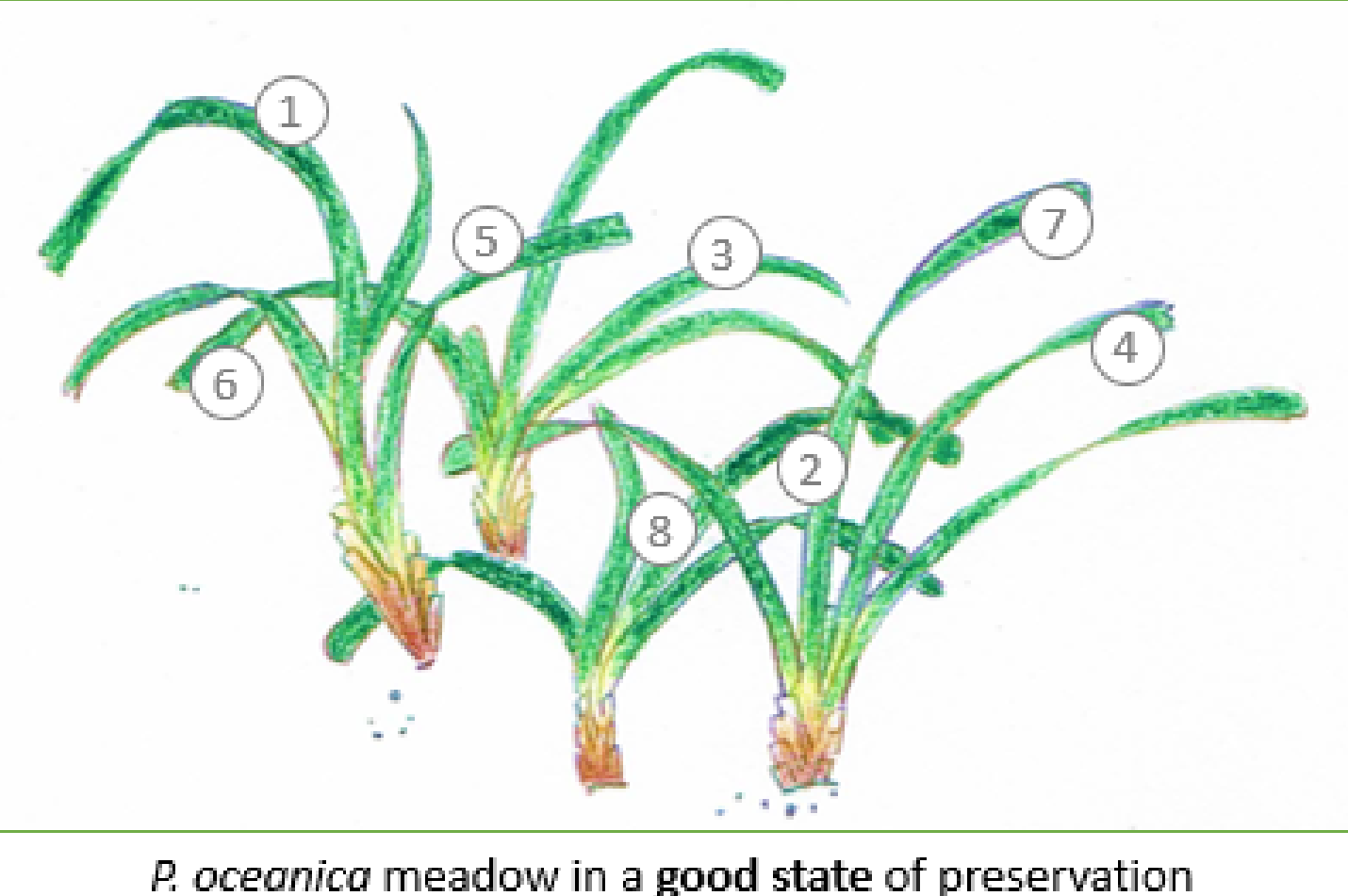
Only foliar epiphytes species were selected and they were classified according to 2 established criteria. Finally, the two communities were characterised and the foliar epiphytes species of the two habitats compared.

RESULTS AND DISCUSSION

CHARACTERISATION

27 spp.

13 Ca	≈ 50 %
6 Pre	≈ 22 %
2 Ge	≈ 7 %
6 In	≈ 22 %

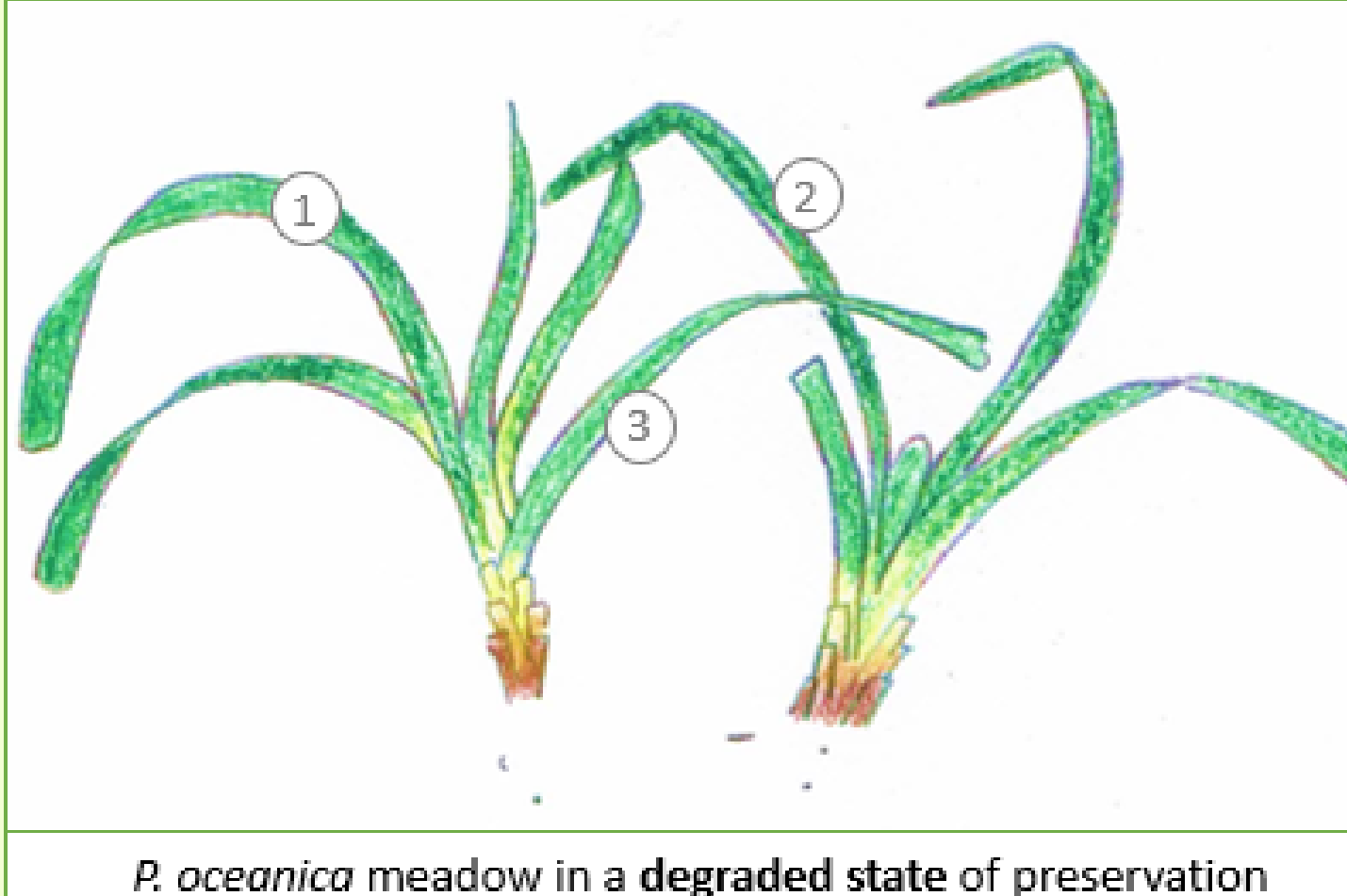


P. oceanica meadow in a **good state of preservation**

- Rhodophyta; 4 spp.
- Phaeophyceae; 5 spp.
- Bryozoa; 5 spp.
- Anthozoa; 2 spp.
- Hydrozoa; 4 spp.
- Annelida; 3 spp.
- Ascidacea; 2 spp.
- Chlorophyta; 1 sp.

13 spp.

3 Ca	≈ 25 %
4 Pre	≈ 30 %
2 Ge	≈ 15 %
4 In	≈ 30 %



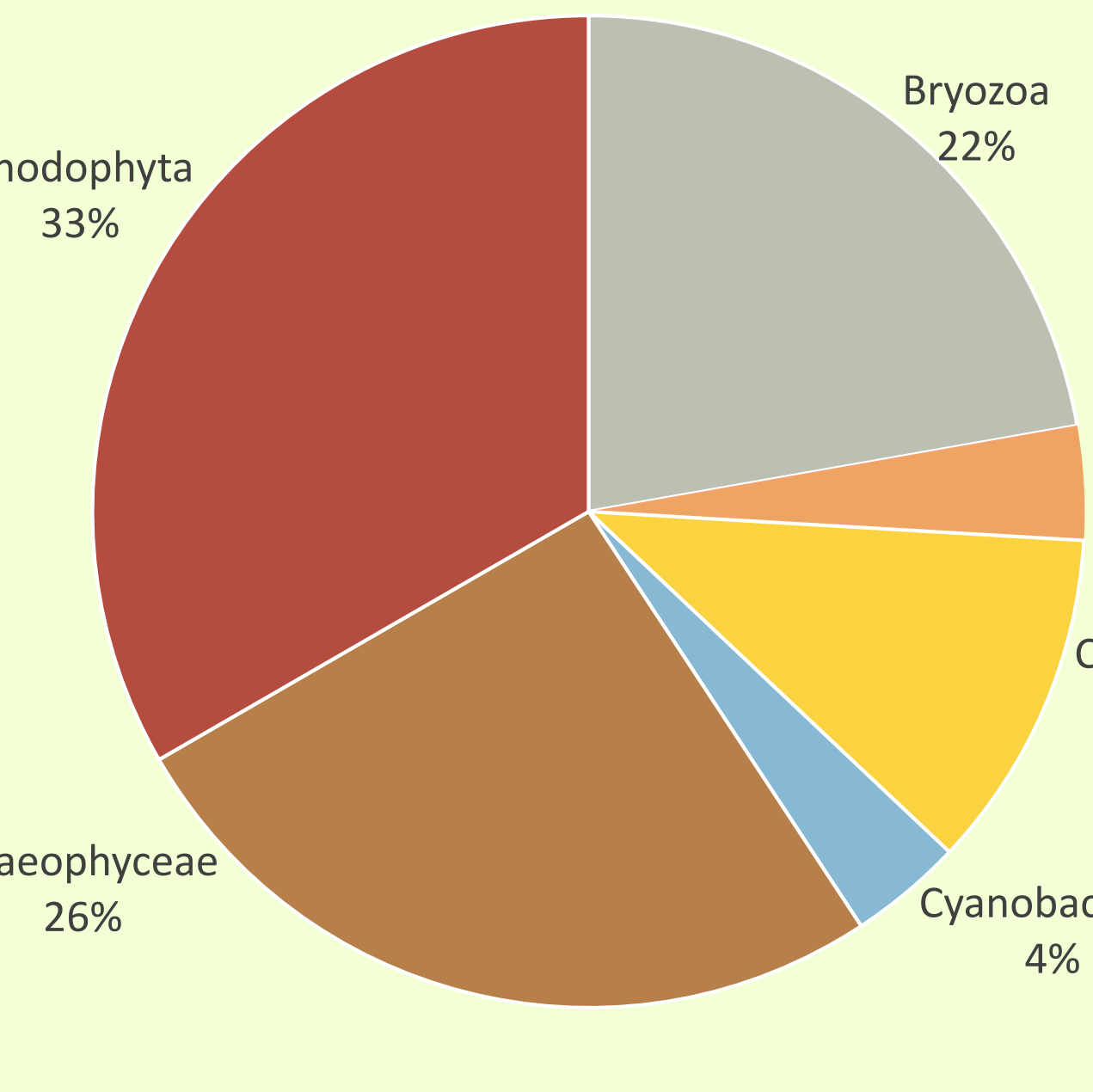
P. oceanica meadow in a **degraded state of preservation**

- Rhodophyta; 5 spp.
- Phaeophyceae; 3 spp.
- Bryozoa; 5 spp.

Figure 2. Results diagram with the taxonomic groups which characterise a **healthy (left)** and a **degraded (right)** *P. oceanica* meadow.

COMPARISON

27 common species

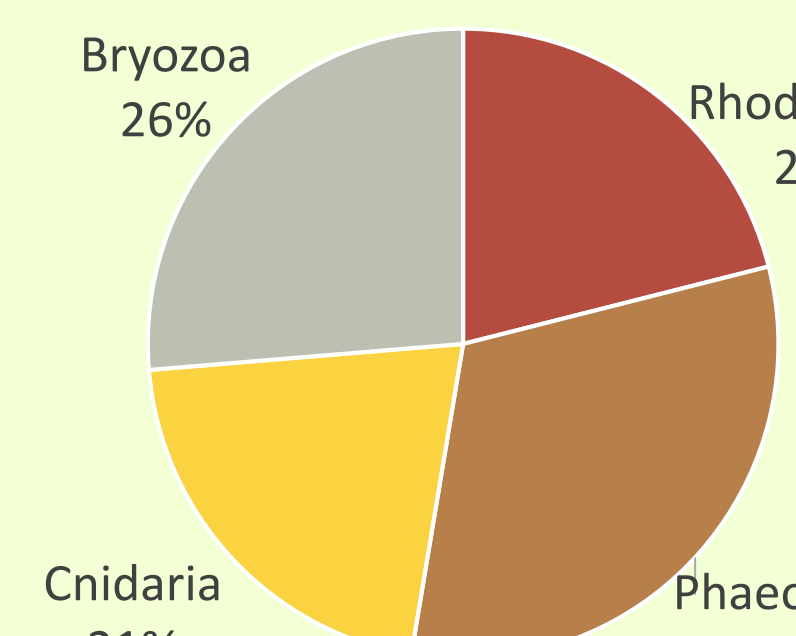


Total common species

Rhodophyta	33%
Phaeophyceae	26%
Bryozoa	22%
Cnidaria	11%
Ascidacea	4%
Cyanobacteria	4%

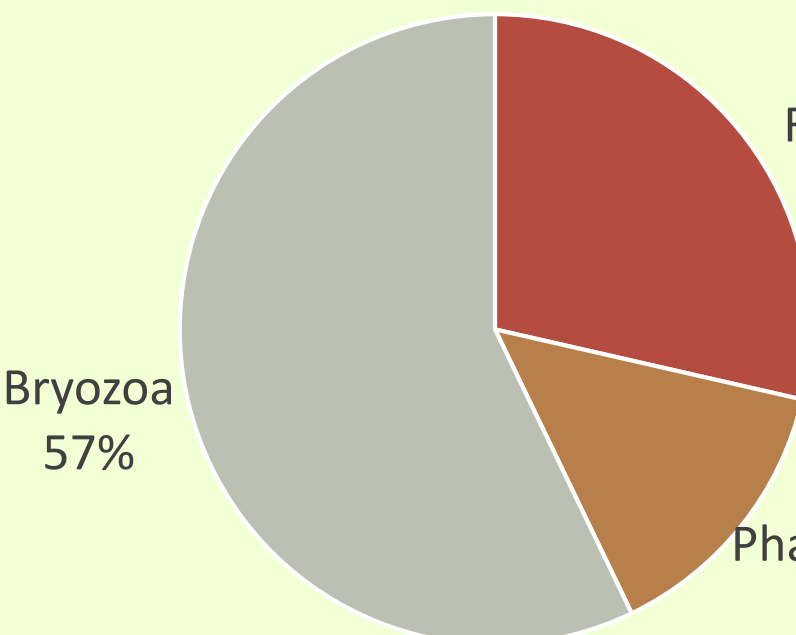
Figure 3. Common species in the two habitats classified by taxonomic groups.

Ca + Pre common species



P. Oceanica **healthy habitat** (n = 19)

Rhodophyta	21%
Phaeophyceae	32%
Cnidaria	21%
Bryozoa	26%



P. Oceanica **degraded habitat** (n = 7)

Rhodophyta	29%
Phaeophyceae	14%
Bryozoa	57%

Figure 4. Characteristic and preferential species classified by taxonomic groups in a healthy habitat and a degraded habitat.

CURRENT SITUATION

— **Least concern** at IUCN Red List

36 % Declining

20 % Increasing

44 % Showing no change

Water quality degraded, anchoring, trawling & coastal modification.

Geological dynamics change.

Non-native macroalgae invasions.

Climate change (↑ temperature & ↑ extreme events).

TREATS

In Catalonia, *P. oceanica* meadows have different preservation states depending on the region.

However, in general, they are showing no change in trajectory due to the management measures taken.

CONCLUSIONS

- It can not be affirmed that *Caulerpa spp.* “meadows” have less biodiversity.
- As an habitat dominated by *P. oceanica* degrades, the composition of species changes: characteristic species decrease and generalist species increase.
- There is not a generalized trend of *P. oceanica* meadows to regression and the main degradation causes are the anthropogenic ones.

MANAGEMENT RECOMMENDATIONS

- More scientific research should be done and it would be convenient to standardise sampling methods.
- In order to preserve these habitats is extremely important to:
 - create networks of nature protection areas
 - keep local monitoring of the *P. oceanica* meadows
 - carry out environmental initiatives

SELECTED REFERENCES:

- Ballesteros, E., García, A., Lobo, A., & Romero, J. (1984). L'alguer de *Posidonia oceanica* de les Illes Medes. En I. Olivella (Ed.), *Els Sistemes naturals de les Illes Medes* (p. 739-759).
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- De los Santos, et al. (2019). Recent trend reversal for declining European seagrass meadows. *Nat. Commun.*, 10(1), 1-8.